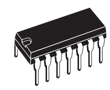
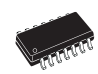
TS27M4C,I,M

PRECISION LOW POWER CMOS QUAD OPERATIONAL AMPLIFIERS

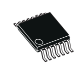
- LOW POWER CONSUMPTION : **150µA/op**
- OUTPUT VOLTAGE CAN SWING TO GROUND
- EXCELLENT PHASE MARGIN ON CAPACITIVE LOADS
- STABLE AND LOW OFFSET VOLTAGE
- THREE INPUT OFFSET VOLTAGE SELECTIONS



N
DIP14
(Plastic Package**)**



D
SO14
(Plastic Micropackage**)**



P
TSSOP14
(Thin Shrink Small Outline Package)

DESCRIPTION

These devices are low cost, low power quad operational amplifiers designed to operate with single or dual supplies. These operational amplifiers use the ST silicon gate CMOS process allowing an excellent consumption-speed ratio. These series are ideally suited for low consumption applications.

Three power consumptions are available allowing to have always the best consumption-speed ratio:

- I_{CC} = 10µA/amp.: TS27L4 (very low power)
- I_{CC} = 150µA/amp.: TS27M4 (low power)
- I_{CC} = 1mA/amp.: TS274 (standard)

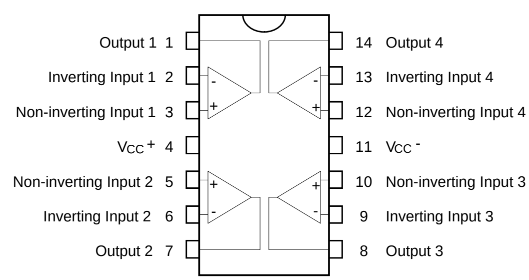
These CMOS amplifiers offer very high input impedance and extremely low input currents. The major advantage versus JFET devices is the very low input currents drift with temperature (see figure 2).

ORDER CODE

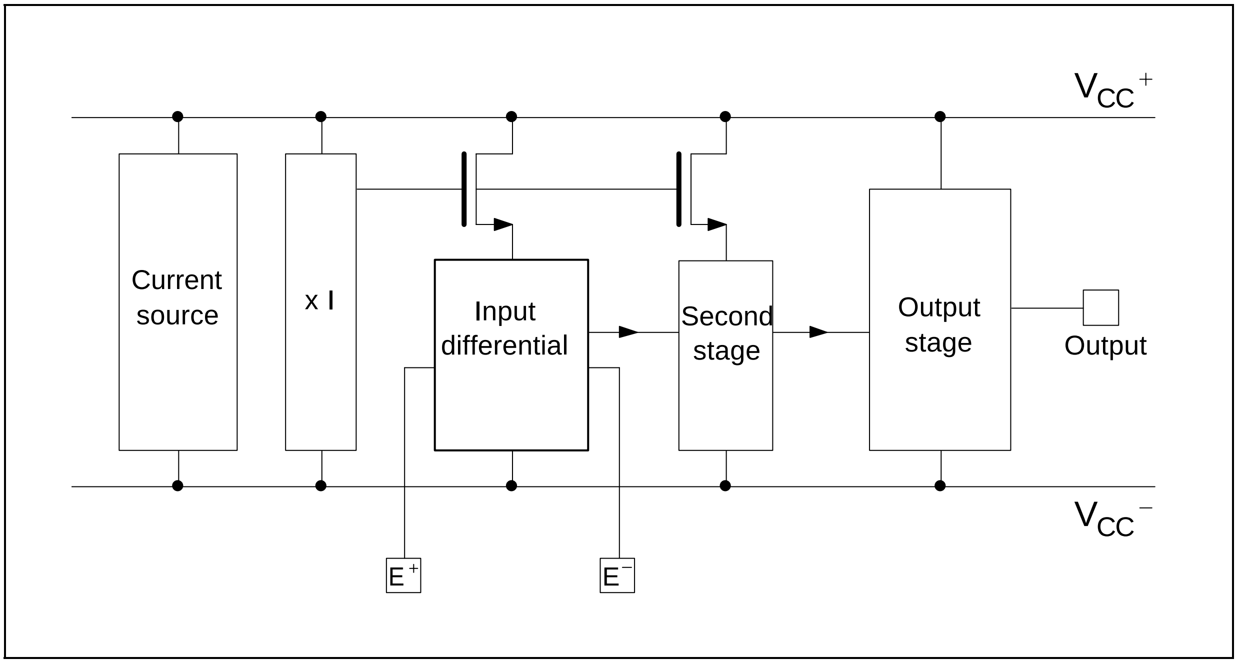
Part Number	Temperature Range	Package		
		N	D	P
TS27M4C/AC/BC	0°C, +70°C	•	•	•
TS27M4I/AI/BI	-40°C, +125°C	•	•	•
TS27M4M/AM/BM	-55°C, +125°C	•	•	•
Example : TS27M4ACN				

N = Dual in Line Package (DIP)
D = Small Outline Package (SO) - also available in Tape & Reel (DT)
P = Thin Shrink Small Outline Package (TSSOP) - only available in Tape & Reel (PT)

PIN CONNECTIONS (top view)



BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

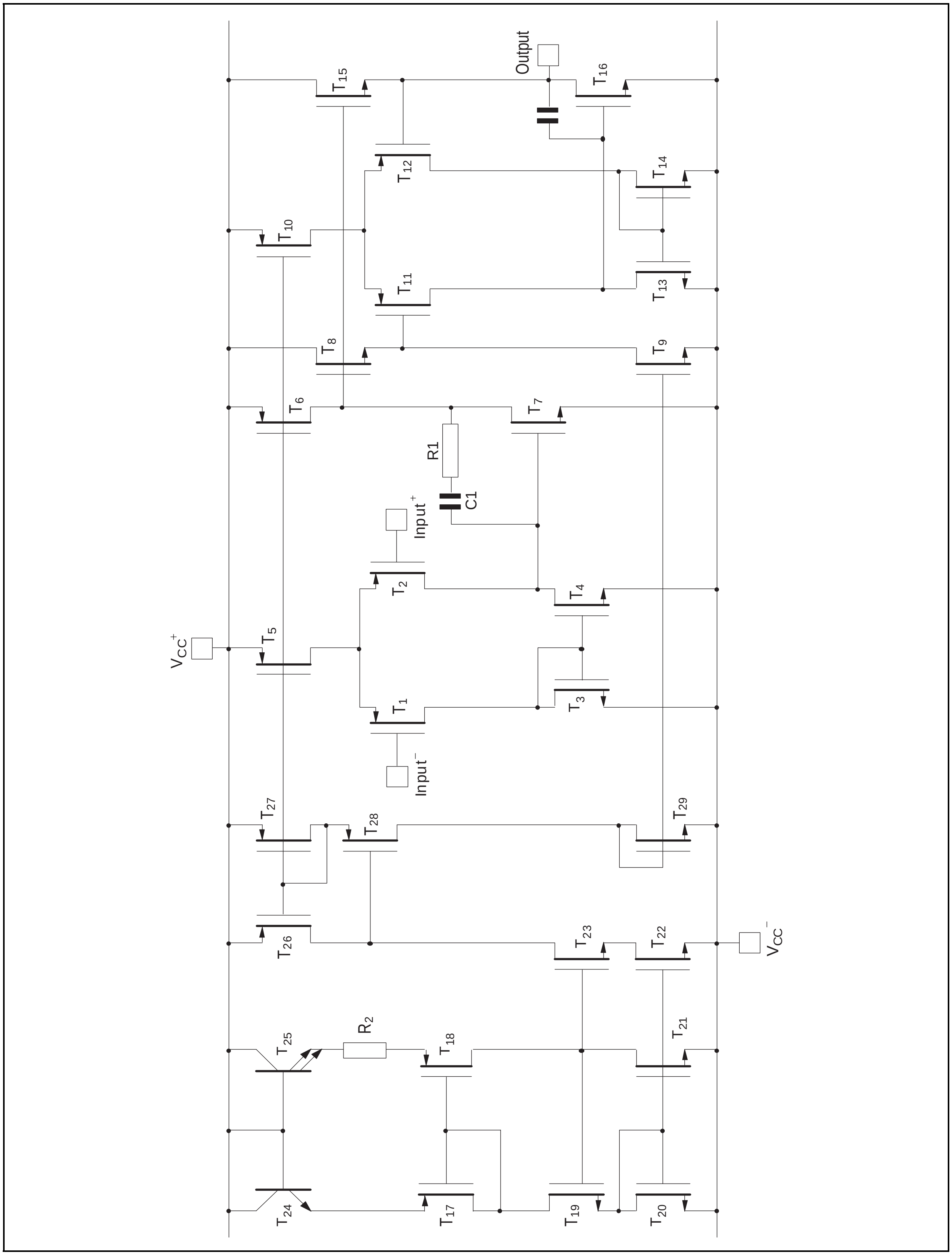
Symbol	Parameter	TS27M4C/AC/BC	TS27M4I/AI/BI	TS27M4M/AM/BM	Unit
V_{CC}^{+}	Supply Voltage [1]	18			V
V_{id}	Differential Input Voltage [2]	±18			V
V_i	Input Voltage [3]	-0.3 to 18			V
I_o	Output Current for $V_{CC}^{+} \geq 15V$	±30			mA
I_{in}	Input Current	±5			mA
T_{oper}	Operating Free-Air Temperature Range	0 to +70	-40 to +125	-55 to +125	°C
T_{stg}	Storage Temperature Range	-65 to +150			°C

1. All values, except differential voltage are with respect to network ground terminal.
2. Differential voltages are the non-inverting input terminal with respect to the inverting input terminal.
3. The magnitude of the input and the output voltages must never exceed the magnitude of the positive supply voltage.

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}^{+}	Supply Voltage	3 to 16	V
V_{icm}	Common Mode Input Voltage Range	0 to V_{CC}^{+} - 1.5	V

SCHEMATIC DIAGRAM (for 1/4 TS27M4)



ELECTRICAL CHARACTERISTICS

V_{CC}^+ = +10V, V_{CC}^-= 0V, T_{amb} = +25°C (unless otherwise specified)

Symbol	Parameter	TS27M4C/AC/BC			TS27M4I/AI/BI TS27M4M/AM/BM			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage V_O = 1.4V, V_{ic} = 0V TS27M4C/I/M TS27M4AC/AI/AM TS27M4B/C/I/M $T_{min} \leq T_{amb} \leq T_{max}$ TS27M4C/I/M TS27M4AC/AI/AM TS27M4B/C/I/M		1.1 0.9 0.25	10 5 2 12 6.5 3		1.1 0.9 0.25	10 5 2 12 6.5 3.5	mV
DV_{io}	Input Offset Voltage Drift		2			2		µV/°C
I_{io}	Input Offset Current note [1)] V_{ic} = 5V, V_O = 5V $T_{min} \leq T_{amb} \leq T_{max}$		1	 100		1	 200	pA
I_{ib}	Input Bias Current - see note 1 V_{ic} = 5V, V_O = 5V $T_{min} \leq T_{amb} \leq T_{max}$		1	 150		1	 300	pA
V_{OH}	High Level Output Voltage V_{id} = 100mV, R_L = 100lΩ $T_{min} \leq T_{amb} \leq T_{max}$	8.7 8.6	8.9		8.7 8.5	8.9		V
V_{OL}	Low Level Output Voltage V_{id} = -100mV			50			50	mV
A_{vd}	Large Signal Voltage Gain V_{iC} = 5V, R_L = 100kΩ, V_o = 1V to 6V $T_{min} \leq T_{amb} \leq T_{max}$	30 20	50		30 10	50		V/mV
GBP	Gain Bandwidth Product A_v = 40dB, R_L = 100kΩ, C_L = 100pF, f_{in} = 100kHz		1			1		MHz
CMR	Common Mode Rejection Ratio V_{iC} = 1V to 7.4V, V_o = 1.4V	65	80		65	80		dB
SVR	Supply Voltage Rejection Ratio V_{CC}^+ = 5V to 10V, V_o = 1.4V	60	80		60	80		dB
I_{CC}	Supply Current (per amplifier) A_v = 1, no load, V_o = 5V $T_{min} \leq T_{amb} \leq T_{max}$		150	200 250		150	200 300	µA
I_o	Output Short Circuit Current V_o = 0V, V_{id} = 100mV		60			60		mA
I_{sink}	Output Sink Current V_o = V_{CC}, V_{id} = -100mV		45			45		mA
SR	Slew Rate at Unity Gain R_L = 100kΩ, C_L = 100pF, V_i = 3 to 7V		0.6			0.6		V/µs
φm	Phase Margin at Unity Gain A_v = 40dB, R_L = 100kΩ, C_L = 100pF		45			45		Degrees
K_{OV}	Overshoot Factor		30			30		%
e_n	Equivalent Input Noise Voltage f = 1kHz, R_s = 100Ω		38			38		$\frac{nV}{\sqrt{Hz}}$
V_{o1}/V_{o2}	Channel Separation		120			120		dB

1. Maximum values including unavoidable inaccuracies of the industrial test.

TYPICAL CHARACTERISTICS

Figure 1 : Supply Current (each amplifier) versus Supply Voltage

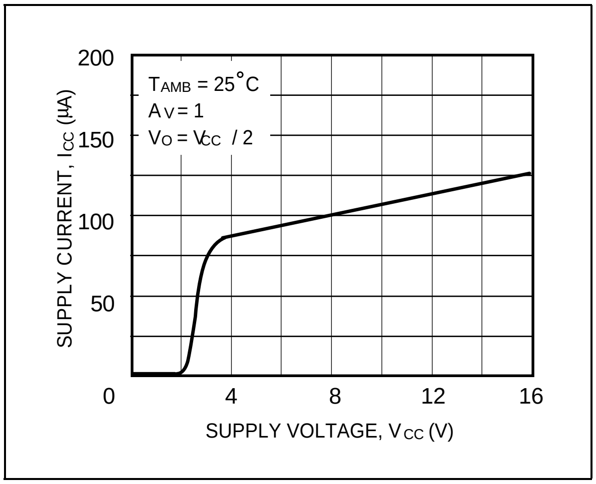


Figure 3b : High Level Output Voltage versus High Level Output Current

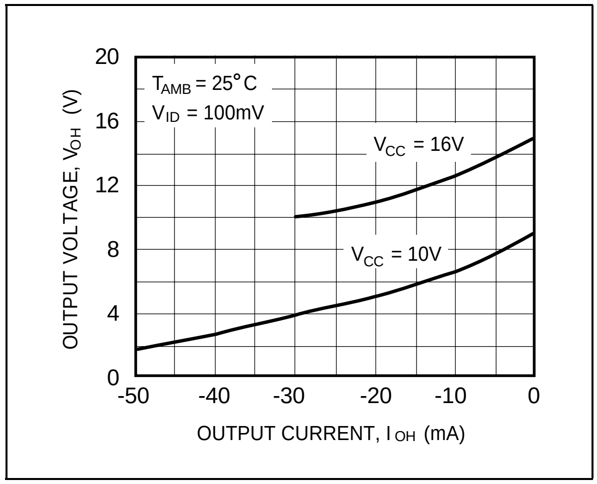


Figure 2 : Input Bias Current versus Free Air Temperature

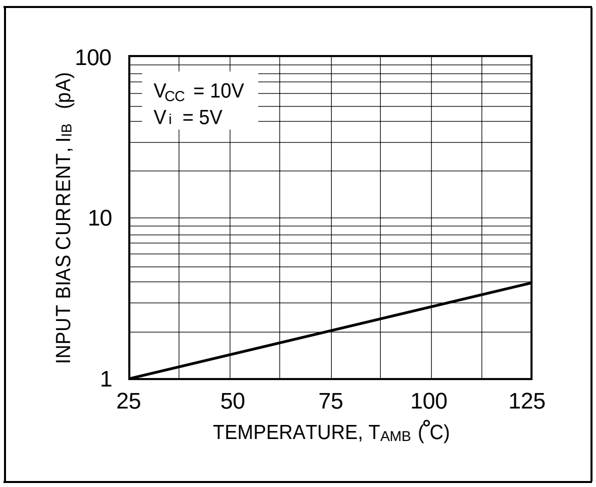


Figure 4a : Low Level Output Voltage versus Low Level Output Current

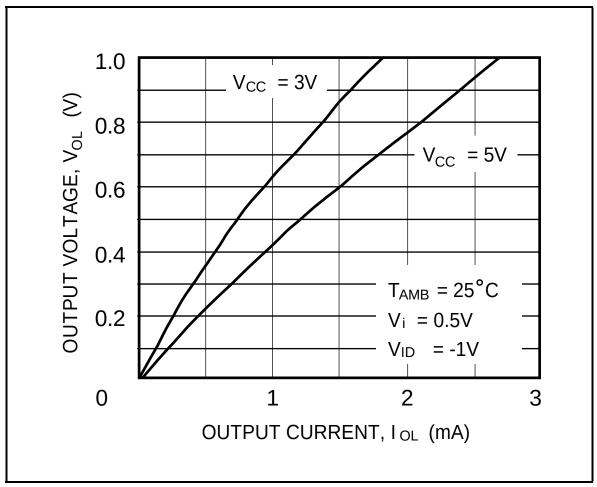


Figure 3a : High Level Output Voltage versus High Level Output Current

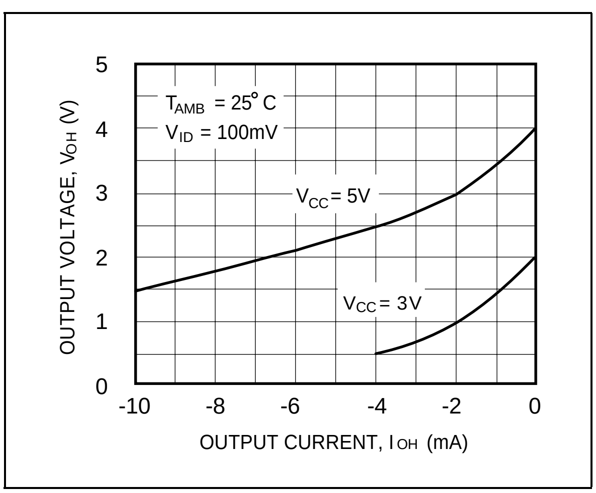


Figure 4b : Low Level Output Voltage versus Low Level Output Current

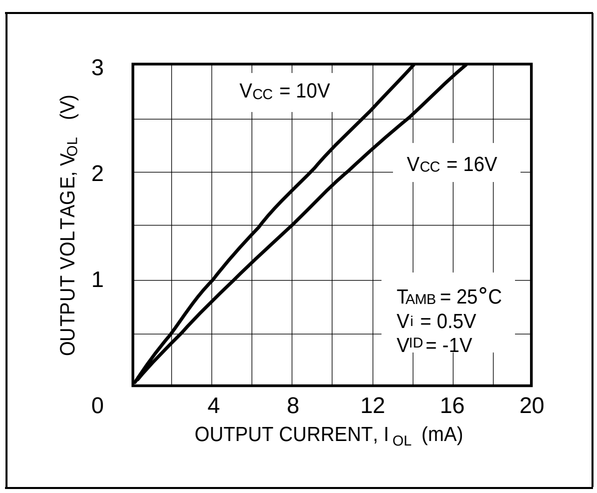


Figure 5 : Open Loop Frequency Response and Phase Shift

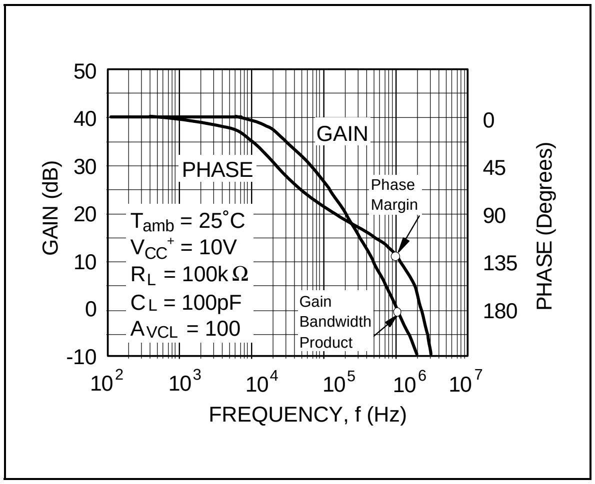


Figure 6 : Gain Bandwidth Product versus Supply Voltage

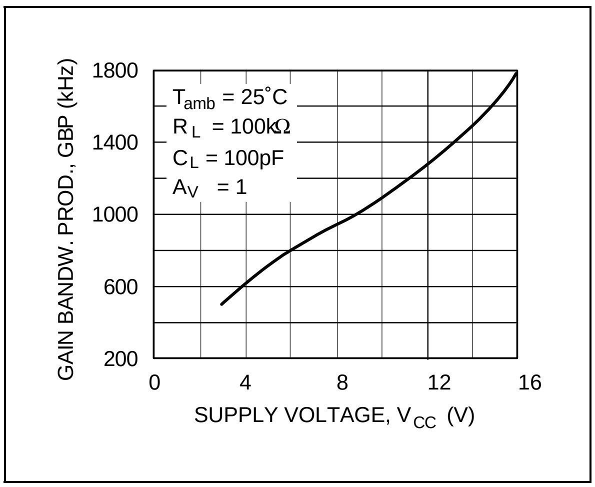


Figure 7 : Phase Margin versus Supply Voltage

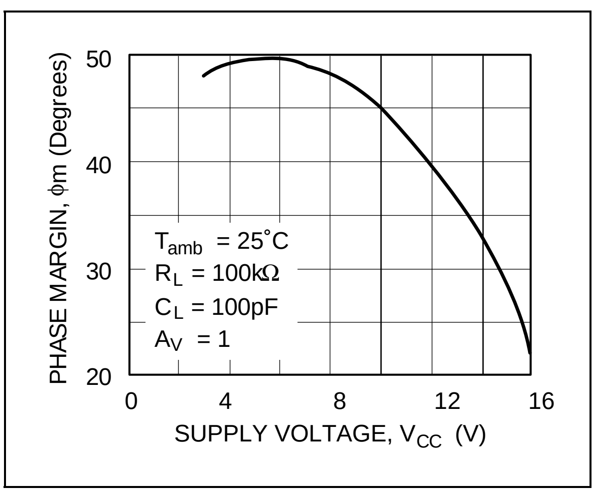


Figure 8 : Phase Margin versus Capacitive Load

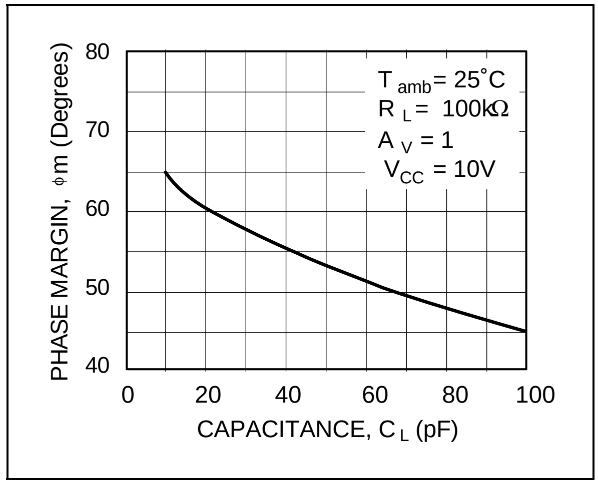


Figure 9 : Slew Rate versus Supply Voltage

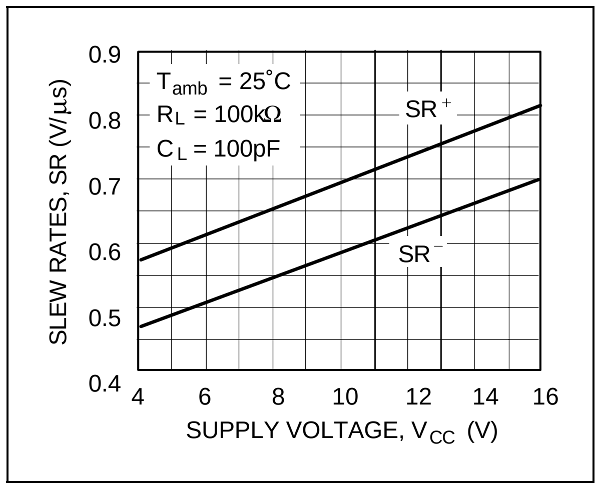
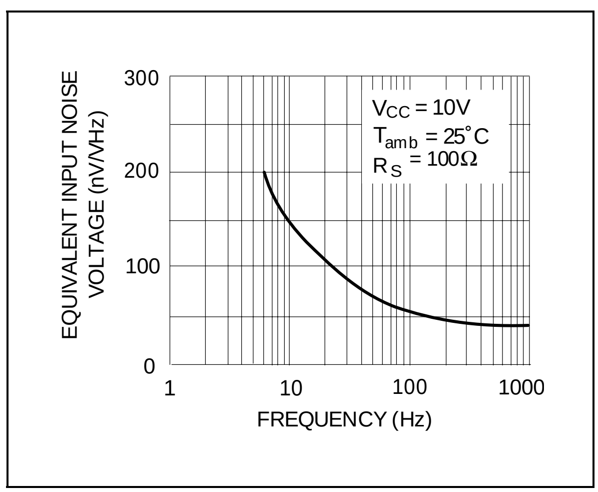
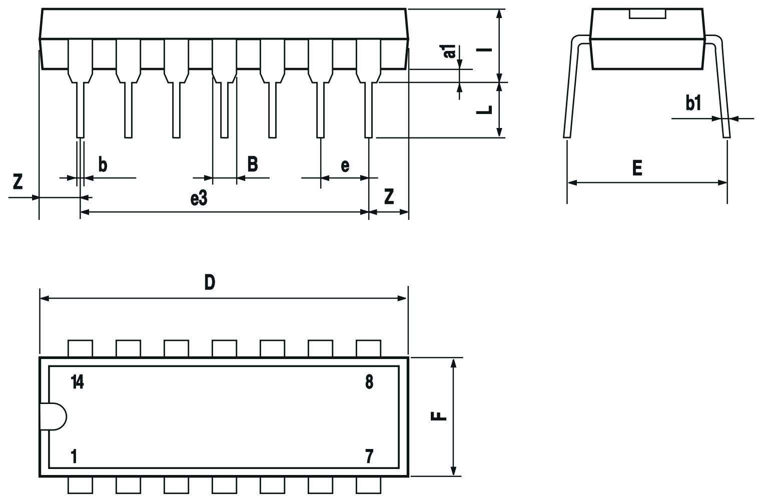


Figure 10 : Input Voltage Noise versus Frequency



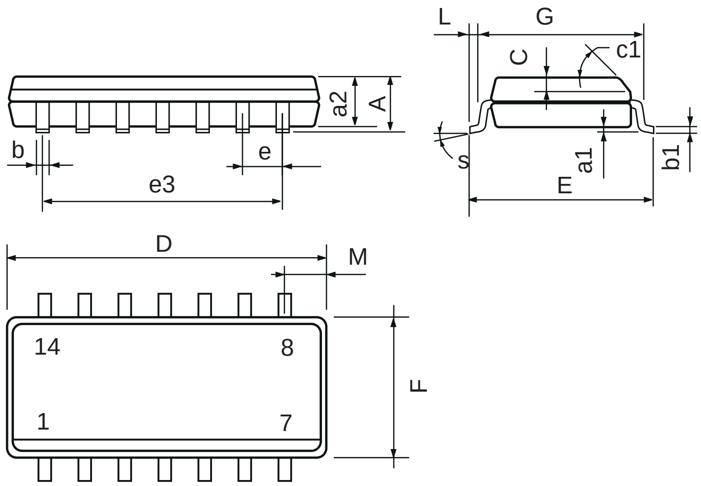
PACKAGE MECHANICAL DATA
14 PINS - PLASTIC DIP



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
i			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100

PACKAGE MECHANICAL DATA

14 PINS - PLASTIC MICROPACKAGE (SO)

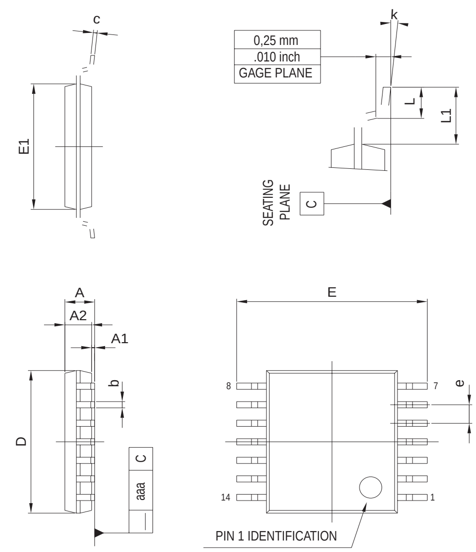


Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.2	0.004		0.008
a2			1.6			0.063
b	0.35		0.46	0.014		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.020	
c1	45° (typ.)					
D (1)	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F (1)	3.8		4.0	0.150		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.020		0.050
M			0.68			0.027
S	8° (max.)					

Note : (1) D and F do not include mold flash or protrusions - Mold flash or protrusions shall not exceed 0.15mm (.066 inc) ONLY FOR DATA BOOK.

PACKAGE MECHANICAL DATA

14 PINS - THIN SHRINK SMALL OUTLINE PACKAGE (TSSOP)



Dim.	Millimeters			Inches		
	Min.	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**
A			1.20			0.05
A1	0.05		0.15	0.01		0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.15
c	0.09		0.20	0.003		0.012
D	4.90	5.00	5.10	0.192	0.196	0.20
E		6.40			0.252	
E1	4.30	4.40	4.50	0.169	0.173	0.177
e		0.65			0.025	
k	0°		8°	0°		8°
l	0.50	0.60	0.75	0.09	0.0236	0.030